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Running head: RELATIONSHIPS, AFFECTIVE PROCESSES, AND HEALTH

Affective processes as mediators of links between close relationships and physical health

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Abstract

Close relationships are known to predict physical health outcomes. The time has come for a shift toward achieving a better understanding of the underlying mechanisms. One promising group of psychological mechanisms is affective processes, such as discrete emotions, emotion regulation, and affect reactivity. In this paper, we discuss the evidence linking relationship functioning with both the positive and negative valences of each affective process, considering the contributions of different types of close relationships across the lifespan, and the evidence for each affective process impacting physical health. We note evidence suggesting that affective processes may also have a causal impact on relationship function. When available, we review literature testing full mediational pathways, from relationship functioning to affective processes to physical health, as the ideal methodology for testing these links. Finally, we identify core themes and propose key future directions for this research.

Affective processes as mediators of links between close relationships and physical health

Since House, Landis, and Umberson's (1988) ground-breaking review of work showing links between social integration and health, it has been established that close relationships can have an important impact on health outcomes (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Seeman, 2000). Researchers have highlighted certain social ties that may have an outsized impact, such as close relationships (e.g., parent-child, friendship, and romantic relationships). However, simply having close relationships is not enough. These relationships need to be high-quality, characterized by mutual trust, satisfaction, and responsiveness, in order to impart health benefits. Low-quality relationships, characterized by hostility and conflict, can actually have negative effects on physical health (Farrell & Simpson, 2017; Slatcher & Selcuk, 2017). High-quality relationships can improve health by buffering stress via processes such as social support (Cohen & Wills, 1985; Hostinar, Sullivan, & Gunnar, 2014), but positive relationship factors such as perceived partner responsiveness have been found to have direct, main-effect style impacts on health regardless of level of stress (Slatcher & Schoebi, 2017) (for a review of buffering versus direct effects models of social support on health, see Cohen & Wills, 1985). Overall, meta-analyses have found that relationship quality is consistently associated with health outcomes (Robles, Slatcher, Trombello, & McGinn, 2014), and the effects of relationship quality on mortality are roughly equivalent to those of smoking and greater than BMI or exercise (Holt-Lunstad, Smith, & Layton, 2010).

Now that links between relationships and health have been identified, the time has come for a shift toward understanding underlying mechanisms. Although effects of close relationships on a variety of biological mechanisms, such as hypothalamic-pituitary-adrenal (HPA axis; Miller, Chen & Zhou, 2007) and inflammatory pathways (Kiecolt-Glaser, Gouin, & Hantsoo, 2009), have been demonstrated, less work has tested the *psychological* pathways

(i.e., cognitions, emotions) linking health and relationships. Understanding how social relationships impact physical health through psychological pathways is essential for identifying potential modifiable targets for designing effective psychosocial interventions and therapies.

A category of psychosocial mediators garnering increasing interest from researchers is *affective processes*, which we define here as the extent to which people feel, express, and regulate positive and negative emotions in response to the experiences they face in daily life. Emotions have key social functions stemming from the unique challenges of living in groups, communicating and evoking complementary responses regarding the need to take action, avoid unpleasant or dangerous things, and build cooperative bonds (Keltner & Haidt, 2001), all of which are critical in close relationship contexts. This review will not focus on mood disorders (e.g., clinical depression, anxiety) as mediators of relationship-health links, although there is a large body of work suggesting that these links exist (for a review, see Kiecolt-Glaser & Wilson, 2017). Instead, we focus on everyday, non-clinical emotional experiences as mediators linking close relationship functioning with physical health outcomes, as well as biomarkers indicating dysfunction in the HPA axis and inflammatory regulation processes.

In this paper, we discuss three major affective processes comprising the bulk of the existing research on relationships, emotion, and health: discrete emotional experiences, emotion regulation, and affect reactivity. For each, we discuss the evidence linking relationship functioning with that affective process, considering the contributions of different types of close relationships across the lifespan, and the evidence for the positive and negative sides of each affective process impacting physical health. We note evidence suggesting that affective processes may also affect relationship functioning, creating a recursive cycle between relationship functioning and affective processes. When available, we review

literature testing full mediational pathways, from relationship functioning to affective processes to physical health. Except when otherwise noted, samples in the papers reviewed are drawn from Western countries and are predominantly white middle-class to upper middle-class socioeconomic status. This is a limitation of this research (and indeed, most human subjects research; for more on this topic, see Henrich, Heine, & Norenzayan, 2010), to which we return later on in this article. Finally, we end by identifying core themes across affective processes and by proposing some key future directions for this line of research.

Discrete Emotional Experiences

Emotions refer to subjective experiences about meaningful events that involve particular behavioral manifestations and physiological reactions (Cowen & Keltner, 2017). Typically, emotions are conceptualized as discrete experiences and are categorized based on their valence (Cowen & Keltner, 2017). Negative emotions (e.g., anger, anxiety, irritation) refer to experiences involving unpleasant interactions with the environment, whereas positive emotions (e.g., amusement, gratitude, contentment) involve pleasant interactions with the environment.

Emotions can trigger biological processes by activating the autonomic nervous system and the HPA axis (Kudielka, Hellhammer, & Wust, 2009), and they often motivate health behaviors such as smoking, drinking, and over-eating (Considine & Moskowitz, 2007). Thus, affective processes are perhaps the most proximal psychological mediators of the association between social experiences and health, with ample evidence showing that both negative and positive emotional experiences can be major contributors to morbidity and mortality (Pressman & Cohen, 2005; Boyle et al., 2005; Chida & Steptoe, 2009; Polk, Cohen, Doyle, Skoner, & Kirschbaum, 2005).

In close relationships, individuals experience intense emotions that can increase closeness and intimacy within the dyad (Butler, 2011; Reis & Shaver, 1988). Research has

shown that affiliation processes within close relationships, such as disclosing thoughts and feelings and providing/receiving social support, help relieve anxiety and reduce negative affect (Jakubiak & Feeney, 2016; Kane, Slatcher, Reynolds, Repetti, & Robles, 2014; Slatcher, Robles, Repetti, & Fellows, 2010). Furthermore, experiences of joy, contentment, and gratitude can promote relational well-being by increasing trust and solidifying bonds (Campos, Schoebi, Gonzaga, Gable & Keltner, 2015; Kubacka, Finkenauer, Rusbult, & Keijsers, 2011). In contrast, relationship experiences such as resentment, secrecy, and conflict can lead to worry, hostility, and other forms of negative affect (Slepian, Chun, & Mason, 2017; Kiecolt-Glaser et al., 2005).

Some of the most compelling evidence on the links between close relationships, emotions, and health originates from laboratory studies in which experimenters observe emotional reactions to conflict interactions (e.g., Gottman & Levenson, 1992; Ehrlich, Miller, & Chen, 2015). In these paradigms, participants are asked to discuss a problematic issue while experimenters record their behavioral and physiological responses. Negative emotions emerging from these stressful interactions are associated with alterations in biological markers of health. For example, greater hostility during conflict between romantic partners is associated with less effective and less numerous immune cells (Kiecolt-Glaser et al., 1993), greater production of pro-inflammatory cytokines (Kiecolt-Glaser et al., 2005), slower wound healing (Kiecolt-Glaser et al., 2005), and greater blood pressure reactivity (Miller et al., 1999). Greater expressions of negative affect and hostility during parent-child interactions in the lab predict worse asthma symptoms and lower anti-inflammatory gene expression in a sample of youth with asthma (Ehrlich, Miller, & Chen, 2015). These relationship-elicited emotions can have lasting effects. One longitudinal investigation in adults showed that hostility, anger, and stonewalling during conflict discussions with a romantic partner predict

cardiovascular and musculoskeletal symptoms 20 years later (Haase, Holley, Block, Verstaen, & Levenson, 2016).

Altogether, laboratory studies show that negative emotions during stressful situations have clear associations with maladaptive responses of various stress-regulation systems. However, this literature presents some important limitations. First, although this paradigm reveals clear links between negative emotions and biological markers of health, these conclusions are based on observations of 10-15 minutes at most. Although this “thin slice” behavior is informative, it still provides a very narrow window on the range of interpersonal situations unfolding between close partners. Second, studying conflict does not offer enough information about the influence of positive emotions on health, as conflict does not typically provide ample opportunities for positive emotions to emerge.

Studies that examine close relationship processes and health-related outcomes in daily life capture a wider picture of interpersonal interactions taking place over longer periods of time (and focus both on negative *and positive* relationship processes and emotions) by using daily diary reports or even direct observation of emotion experiences in daily life (i.e., Mehl, Robbins, & Deters, 2012; Tobin et al., 2015). When examining the links between negative emotional experiences and health, daily experience studies generally mirror key findings from the laboratory. For example, among married partners, work worries are associated with unhealthy daily cortisol profiles, especially for wives who are low in marital satisfaction or who report few opportunities to self-disclose to their husbands (Slatcher, Robles, Repetti, & Fellows, 2010). Studies on adolescents have also shown links between challenges in relationships and detrimental consequences on psychological well-being and physiological markers of health (Adam et al., 2011; Ehrlich, Miller, Rohleder, & Adam, 2016; Imami, Zilioli, Tobin, Saleh, Kane, & Slatcher, 2017; Ross, Martin, Chen, & Miller, 2011). These links emerge when youth engage in behaviors that signal experiences of interpersonal stress

stemming from lack of intimacy and low trust, such as secrecy from parents (e.g., Imami et al., 2017) and cold, hostile interactions with parents and peers (e.g., Ehrlich et al., 2011). For example, a recent study on adolescent girls found that social interactions that elicited anger and shame increased levels of several physiological markers tied to cardiovascular disease risk two years later (Ross, Martin, Chen, & Miller, 2011).

Daily experience research also suggests that intimacy-enhancing processes influence health by promoting declines in negative affect and enhancing feelings of security and trust. Researchers have shown that daily self-disclosure is associated with better sleep in wives via reductions in negative affect (Kane et al., 2014). In addition to declines in negative affect, studies have also identified enhancements in positive affect as a function of perceiving one's partner as caring and understanding (Gable, Reis, Impett, & Asher, 2004), or as a reliable and trustworthy source of support (Jakubiak & Feeney, 2016). Recent studies have also documented same-day and longitudinal links between perceived partner support, greater well-being, higher sleep quality and less physical symptoms (Jakubiak & Feeney, 2016; Otto, Laurenceau, Siegel, & Belcher, 2015), which corroborate previously established links between social support and physical well-being (Uchino, 2009). However, the influence of positive relationship processes on health has not been as widely investigated as the influence of negative processes.

Most importantly, daily experience studies are among the few to test the full mediational pathway from relationship functioning to emotion to health. For example, couples who spent more time engaging in intimate behaviors (e.g. hugging or kissing) showed lower cortisol levels over one week, and this effect was mediated by greater experiences of positive affect (Ditzen, Hoppmann, & Klumb, 2008). Another study showed that perceived partner responsiveness was associated with healthier cortisol profiles 10 years later and this effect was mediated by reductions in negative affect (Slatcher, Selcuck, & Ong,

2015). This pathway is also reflected in parent-child relationships. For example, maternal responsiveness (rated objectively through brief audio-recordings over four days) was found to be associated with lower levels of inflammatory cytokines in a sample of youth with asthma (Tobin et al., 2015). This effect was mediated by greater expressions of youth positive affect, even after controlling for the influence of negative affect.

In summary, both lab and daily experience studies have shown that low-quality relationship functioning leads to increases in negative emotionality and worse health outcomes, and daily experience studies have shown that high-quality relationship functioning results in higher positive emotionality and better health outcomes. A few studies have tested and found evidence for the full mediational path for high quality relationships, showing that high quality relationship functioning results in increases in positive emotionality and decreases in negative emotionality, which in turn results in healthier HPA axis functioning and reduced inflammation.

Emotion Regulation

Although relationships evoke strong positive and negative emotions, individuals' emotional experiences are not entirely out of their control. People engage in emotion regulation strategies to increase, decrease, or maintain emotional responses (Gross, 2001). Most of the research on relationships, emotion regulation, and health has focused on the ability to regulate emotion broadly or on two specific strategies: *Reappraisal*, which involves cognitively re-evaluating a situation to decrease its emotional impact, and *suppression* or *repression*, which involves inhibiting expression of emotion (Gross, 2001). Suppression is associated with greater sympathetic nervous system activity, which is a marker of stress response, than reappraisal (Gross, 1998), while reappraisal is associated with adaptive cardiovascular threat responses (Mauss, Cook, Cheng, & Gross, 2007). General tendencies towards suppression also have been found to increase risks for disease, especially cancer,

hypertension, and coronary heart disease, and mortality (Denollet et al., 1996; Mund & Mitte, 2012).

Parenting and early family environments are a key source for learning about emotion regulation. Children learn about emotion regulation by observing and modelling what parents do, but also more directly through the parent-child relationship (Morris, Criss, Silk, & Houltberg, 2017; Morris, Silk, Steinberg, Myers, & Robinson, 2007). Parents who express understanding, validate their children's emotional responses, and use the opportunity to build intimacy and problem-solve (rather than be dismissive), a set of behaviors referred to as "emotion coaching," produce children who are more effective emotion regulators (Eisenberg, Fabes, & Murphy, 1996; Gottman, Katz, & Hooven, 1996). Furthermore, secure attachment in infancy (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002) and adolescence (Kobak & Sceery, 1988) is associated with better emotion regulation. Although less empirical work has examined how adult romantic relationships affect individuals' emotion regulation strategy use, these tendencies should remain malleable. Attachment orientations change in adulthood based on romantic experiences (Mikulincer & Shaver, 2007) and predispose individuals towards different regulation strategies. Individuals high in avoidance are prone to suppression, while individuals high on attachment anxiety tend to reappraise, but in the less healthy direction: They perceive relationship situations as more threatening than they truly are and ruminate on negative experiences (Shaver & Mikulincer, 2007).

Beyond the use of specific emotion regulation strategies, close relationship partners can help one another cope with negative emotions and stress more generally. Close relationship dyads frequently form patterns of *co-regulation*, in which both partners influence one another's emotional experiences and physiological arousal levels in ways that help promote stability over time (Butler & Randall, 2013). One key way in which relationship partners can help maintain positivity over time is through social support processes. Social

support is designed to reduce negativity in the face of stressors (Cohen & Wills, 1985), and the effectiveness of social support is often measured by reductions in negative mood or increases in positive mood (Bolger, Zuckerman, & Kessler, 2000; Cohen et al., 1985; Feeney, 2004). However, perceived availability of support has frequently been found to be a stronger predictor of health outcomes than received support (Holt-Lunstad & Uchino, 2015), and receiving high levels of support has in some cases been found to increase key negative health outcomes like mortality rates (Forster & Stoller, 1992; Selcuk & Ong, 2013). Some studies on friendship have shown that close relationship partners can also regulate emotion in more maladaptive ways. A study on ambivalent friendship, characterized by high positive and negative relationship processes, showed that spending time with an ambivalent friend before a stressor increased anxiety as well as heart rate and blood pressure (Holt-Lunstad, Uchino, Smith, & Hicks, 2007).

The path between relationships and emotion regulation is bi-directional and particularly complicated in relationship settings because both partners are trying to express and regulate their own emotions while attempting to understand and respond to their partner's emotions and emotion regulation (Levenson et al., 2013). As described previously, negative emotionality can take a toll on relationship functioning, so regulating potentially destructive emotions like anger is key. For example, relationship-specific negative emotions such as contempt are highly predictive of divorce (Gottman, 1994), and husbands' inability to downregulate negative emotionality more generally during conflict also predicted divorce rates over time (Gottman, Coan, Carrere, & Swanson, 1998). However, given that self-disclosure and intimacy are so critical to building and maintaining close relationships (Reis & Shaver, 1988), feeling that a partner is holding back may also be detrimental to relationship perceptions. Indeed, Butler and colleagues (2003) found that when one person in a pair of interaction partners was told to suppress his/her emotions, this not only disrupted the flow of

communication and the building of rapport between the partners, but the blood pressure of *both* partners increased. However, the content of these disclosures can also matter:

Excessively discussing negative emotional experiences, known as co-rumination, can increase relationship closeness but also increase depressive symptoms in pre-adolescent girls by normalizing negative emotionality (Rose, Carlson, & Waller, 2007). Close relationship partners must find a balance between regulating and expressing emotion to maintain high relationship quality and good health.

Almost no studies have tested the full mediational path from relationship functioning to emotion regulation to health. In one exception, adolescents' ratings of supportive parenting were found to predict their ratings of their general physical health via their tendencies to actively engage to cope with stressors (Swanson, Valiente, Lemery-Chalfant, & Caitlin O'Brien, 2011).

In summary, high quality close relationships help individuals learn and use effective emotion regulation strategies to down-regulate negative emotionality. Poorer relationship functioning predisposes people to use strategies that are less effective at downregulating negative emotionality and have greater physiological costs (i.e., suppression), or even increase negative emotionality through rumination. There is some evidence that different emotion regulation strategies affect health outcomes. However, only one study provides evidence for a mediational pathway from parenting to active engagement coping to self-reported health, despite ample theoretical evidence for such pathways to exist across relationship types and emotion regulation strategies.

Affect Reactivity to Stressors

One major consequence of emotion regulation tendencies is how strongly individuals react to everyday events. In response to daily stressors, individuals may experience an increase in negative affect (i.e., *NA reactivity*), or a decrease in positive affect (i.e., *PA*

reactivity). Imagine, for instance, that you have an argument with a co-worker. Following the argument, you may suddenly feel quite frustrated or upset (NA reactivity) and much less enthusiastic (PA reactivity). Reactivity is assessed by measuring within-person change in NA and PA from non-stressor days to stressor days (see Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013; Selcuk et al., 2016).

NA and PA reactivity to daily stressors can take a long-term toll on health and well-being (Almeida, 2005). For example, greater NA and PA reactivity to stressors is linked to poorer sleep (Ong et al., 2013), more chronic health problems (Piazza, Charles, Sliwinski, Mogle, & Almeida, 2013), higher inflammation (Sin, Graham-Engeland, Ong, & Almeida, 2015), and greater mortality risk (Mroczek et al., 2015; Wilson, Bienias, Mendes de Leon, Evans, & Bennett, 2003).

Reactivity to daily stressors should be driven partially by personal and psychosocial factors, since individuals' resources (e.g., demographic factors, personality) and social support networks, and larger social-cultural contexts and norms influence how they appraise and cope with everyday events (Almeida, 2005; Lazarus, 1999). Most research to date has focused on non-relational psychosocial factors, such as optimism (Ikeda et al., 2011) and depressive and anxiety symptoms (Glaser et al., 2003), but some research has investigated how relationship dynamics predict affect reactivity. For example, interpersonal conflicts may be among the most common and upsetting daily stressors individuals encounter, and thus trigger greater affect reactivity (Bolger, DeLongis, Kessler, & Schilling, 1989), especially for younger persons (Charles et al., 2009). Some research has linked higher attachment anxiety to greater affect reactivity, which partially explained the increased general negativity and interpersonal problems often experienced by anxiously attached persons (Mikulincer & Shaver, 2007), though affect reactivity was measured dispositionally rather than in response to daily stressors (Wei et al., 2005).

However, positive relationship functioning may downregulate affect reactivity to daily stressors. Recent research suggests that greater perceived partner responsiveness predicts lower NA reactivity, which then predicts better eudaimonic well-being (Selcuk et al., 2016) and lower mortality risk (Stanton et al., 2018) a decade later. These studies are some of the only evidence for affect reactivity to stressors mediating links between close relationships and health. Future research would benefit from greater understanding of how acute affective responses to day-to-day stressors help explain associations between relational factors (e.g., loneliness, communication, attachment) and health, across different types of close relationships. For example, no studies have investigated children's NA and PA reactivity to daily stressors. Future studies could also investigate affect reactivity at the dyadic level; it is possible that one partner's affect reactivity might have downstream effects on the other partner's own reactivity, health outcomes, or on relationship functioning.

In summary, there is ample evidence that greater (both positive and negative) affective reactivity to stressors results in worse health, and some evidence that high-quality romantic relationships stabilize affect reactivity. One study does test the full mediational pathway, finding evidence that increases in relationship quality over time predicts reduced negative affect reactivity to stressors, resulting in reduced mortality rates.

Common Themes and Future Directions

In sum, affective processes constitute some of the most promising directions for understanding the psychological mechanisms underlying links between relationships and health. Discrete emotions, emotion regulation, and emotional reactivity all show links with close relationship functioning and health, and a few studies find evidence for indirect pathways through these affective processes. Overall, there has been a greater emphasis on discrete emotions, particularly negative emotions, providing ample evidence that poor relationship functioning results in greater negative emotionality and worse health. However,

there is also growing evidence for high-quality relationships promoting better health via increased positive emotionality and decreased negative emotionality, and a few studies examining the relational predictors and health outcomes of the emotion regulation and affective reactivity processes that may lead to these differences in emotionality. Nonetheless, there are extremely few studies testing the full mediational pathway from relationship functioning to affective processes to health, despite ample theoretical rationale for such pathways and strong empirical evidence for the component paths. In our review of three core affective processes, a few common themes emerge, which suggest some important directions for future research.

Both positive and negative affective processes are linked with relationships and health. Increased positive affect and decreased negative affect are each linked with salutary health outcomes, and relationship functioning can evoke changes in both. However, we need to clarify when and how both valences of affect are relevant. Many studies only measure positive *or* negative emotions, or use the balance between the two as the measure of affect, making it difficult to determine which form is driving the effect or whether positive and negative affect have independent effects. Furthermore, in some affective processes, one valence is focused on more than the other. For example, although there are many studies on down-regulating negative emotion, we know little about how relationships may lead individuals to up-regulate positive emotions. Similarly, we have good understanding of how negative affective processes activate biological stress responses, but we know less about the biological mechanisms underlying the health effects of positive affective processes. Equal attention to both sides should help clarify the conditions under which different valences of affective processes serve as mediators of relationship-health links.

Although this review focused on how relationship functioning predicts affective processes, the links between affective processes and relationships are consistently bi-

directional. There is a plethora of evidence that emotion regulation and discrete emotions affect relationship quality and functioning, and there is strong theoretical rationale for a similar path for emotional reactivity. These relationship experiences can also be the sources of positive and negative affect, based on the types of experiences that emerge in the relationship. The cyclical process of having conversations with a partner such that positive affect → greater closeness → greater positive affect can be highly beneficial for health and well-being by allowing individuals to broaden their resources for coping with adverse events through building supportive relationships (Fredrickson, 2001). However, individuals in relationships characterized by hostility, poor emotion regulation, and decreased closeness may be especially at risk for poor health and well-being, as these processes add stressors while depleting resources for coping with them. Interventions, particularly those targeting the dyadic level, that are designed to break this destructive cycle could be particularly effective in improving health.

There is growing evidence of dyadic effects, in which one partner's affective processes impact the other partner's health. This research suggests that some processes that have negative impacts on the individual, such as expressing hostility and suppressing emotion, show similar detrimental effects on the health of the partner (e.g., Butler et al., 2003). Identifying when partner effects are relevant across different relationship behaviors, affective processes, and health outcomes can illustrate the health-relevant interdependence between partners. There is also evidence that relationship partners can help remove the burden of regulating emotion and promote healthier reactions, and these dyadic processes may be particularly useful in improving the affective processes of individuals prone to negativity, reactivity, or poor emotion regulation (e.g., insecurely attached individuals).

In our review of the literature we see high consistency in the role of affective processes linking relationships to health in parent-child, friendship, and romantic

relationships. Attachment orientations have long been known to function similarly in both parent-child and adult romantic relationships (Hazan & Shaver, 1987; Roisman, Madsen, Hennighausen, Sroufe, & Andrew Collins, 2001), but we also see similar themes in responsive relationship behaviors promoting more positivity and better health, and dismissive or hostile behaviors in all types of relationships promoting worse health. This suggests that affective processes influence health through the same mechanisms across the lifespan and across different types of relationships. However, more studies, particularly on friendship, everyday affective processes, and health, would help illustrate the stability of these processes across the lifespan.

Affective processes serve as both proximal and distal mediators of relationship-health links. We see immediate connections occurring: For example, relationship conflict elicits negative emotions that are reflected in concurrent physiological and neuroendocrine responding (e.g., Kiecolt-Glaser et al., 1993, 2005; Miller et al., 1999). However, as affective process become general tendencies that are relevant across situations, we also see their effects carried out over decades (e.g., Haase et al., 2016). Furthermore, many of the most detrimental biological effects of these emotions occur when stress systems are activated repeatedly over time and may take longer to emerge. More longitudinal studies of relationships, affective processes, and health will be necessary to understand how these links can lead to more clinical health outcomes that do not emerge until late in life (e.g., cardiovascular disease).

Perhaps the most critical future direction for empirical work in this domain is to test full mediational pathways, from relationship functioning to affective processes to physical health outcomes. Very few studies have tested the full indirect path (for exceptions, see Ditzen, Hoppmann, & Klumb, 2008; Slatcher, Selcuk, & Ong, 2015; Swanson, et al., 2011; Tobin et al., 2015; Selcuk et al., 2016; Stanton et al., 2018). Studies designed to measure all three stages are critical for determining the extent to which different affective processes serve

as causal mechanisms for relationship-health links, and identifying when different affective processes may be implicated. Kemeny's (2003) X-Y-Z model proposes that to make a strong case for psychological factors' impact on disease, it is critical to plot the physiological pathway linking the psychological variable to disease endpoints of interest. Similarly, to understand how external social experiences affect disease, we need to plot the *psychological* pathways that explain how relationships are internalized in ways that trigger biological responses. Although there is ample evidence that relationships evoke each of these affective processes, and that affective processes impact physiological response and disease, we must actually test this indirect path to determine if affective processes are partially or completely explaining this association, or if they are only a secondary by-product of social experience. In particular, demonstrating that increased positive emotionality and decreased negative emotionality is a mediator of the well-documented effects of social support on health would be extremely useful but has yet to be tested.

We can also expand the literature by focusing on additional types of affective processes and physical health outcomes. One promising affective process for illuminating relationship-health pathways is *emodiversity*, the breadth and relative abundance of different emotions that individuals experience. Emodiversity predicts lower inflammation beyond the effects of mean levels of NA and PA (Benson, Ram, Almeida, Zautra, & Ong, 2017; Ong, Benson, Zautra, & Ram, 2018; Quoidbach et al., 2014). No published studies to date have investigated links between close relationships and emodiversity, but there is reason to believe they may be linked; for example, individuals who perceive their partner to be responsive may be more likely to experience greater breadth of positive emotions, which could in turn have associations with better health outcomes. Researchers are also beginning to look at health outcomes beyond those linked to HPA-axis dysfunction and chronic inflammation, such as metabolic processes (Kiecolt-Glaser et al., 2015). This emerging research sheds light on the

links between conflict-related emotions, inflammatory processes, and their consequences for metabolic functioning and obesity.

Finally, it is also critically important to consider the role of culture. Culture shapes how we display and use emotions socially (Keltner & Haidt, 2001), and there is emerging evidence that the health effects of affective processes may be culturally specific: For example, expressing anger is associated with high inflammation and poor cardiovascular functioning in American but not Japanese individuals (Kitayama et al., 2015). The psychological effects of emotion regulation strategies vary across cultures (Butler, Lee, & Gross, 2007; Soto, Perez, Kim, Lee, & Minnick, 2011), and the physical results may as well. Similarly, cultures can vary in norms regarding relationship functioning in ways that impact health: The emphasis on family (*familismo*) and harmonious relationships (*simpatía*) are leading mechanisms explaining Latino individuals' lower rates of poor health and mortality despite having numerous risk factors (Ruiz, Hamann, Mehl, & O'Connor, 2016). The vast majority of the studies reviewed in this paper, like many subareas of psychology, are conducted using predominantly white and Western participants. Making efforts to examine when effects replicate across cultures, and when there are culturally specific differences in links between relationships, affective processes, and health will build a more representative and comprehensive science.

In sum, affective processes are some of the most compelling psychological mechanisms underlying associations between close relationship dynamics and health outcomes. Although research has found robust support for individual links, future studies would benefit from testing the full mediational pathway across different types of relationships over time to illuminate effective targets for health interventions.

References

- Adam, E., Chyu, L., Hoyt, L., Doane, L., Boisjoly, J., Duncan, G., Chase-Lansdale, L., & McDade, T. (2011). Adverse adolescent relationship histories and young adult health: Cumulative effects of loneliness, low parental support, relationship instability, intimate partner violence and loss. *Journal of Adolescent Health, 49*(3), 278–286.
- Beck, L. A., Pietromonaco, P. R., DeBuse, C. J., Powers, S. I., & Sayer, A. G. (2013). Spouses' attachment pairings predict neuroendocrine, behavioral, and psychological responses to marital conflict. *Journal of Personality and Social Psychol, 105*(3), 388-424. doi:10.1037/a0033056
- Benson, L., Ram, N., Almeida, D. M., Zautra, A. J., & Ong, A. D. (2017). Fusing Biodiversity Metrics into Investigations of Daily Life: Illustrations and Recommendations With Emodiversity. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, gbx025.
- Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology, 79*, 953.
- Butler, E. A., Egloff, B., Wilhelm, F. H., Smith, N. C., Erickson, E. A., & Gross, J. J. (2003). The social consequences of expressive suppression. *Emotion, 3*, 48.
- Butler, E. A., Lee, T. L., & Gross, J. J. (2007). Emotion regulation and culture: Are the social consequences of emotion suppression culture-specific? *Emotion, 7*, 30.
- Butler, E. A., & Randall, A. K. (2013). Emotional coregulation in close relationships. *Emotion Review, 5*, 202-210.
- Cohen, S., Mermelstein, R., Kamarck, T., Hoberman, H., Sarason, I. G., & Sarason, B. R. (1985). Measuring the functional components of social support *Social support: Theory, research and application*. (pp. 73-94).

- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98, 310-357.
- Denollet, J., Rombouts, H., Gillebert, T., Brutsaert, D., Sys, S., & Stroobant, N. (1996). Personality as independent predictor of long-term mortality in patients with coronary heart disease. *The Lancet*, 347, 417-421.
- Eisenberg, N., Fabes, R. A., & Murphy, B. C. (1996). Parents' reactions to children's negative emotions: Relations to children's social competence and comforting behavior. *Child Development*, 67, 2227-2247.
- Farrell, A. K., & Simpson, J. A. (2017). Effects of relationship functioning on the biological experience of stress and physical health. *Current Opinion in Psychology*, 13, 49-53.
doi:<http://dx.doi.org/10.1016/j.copsyc.2016.04.014>
- Feeney, B. C. (2004). A secure base: Responsive support of goal strivings and exploration in adult intimate relationships. *Journal of Personality and Social Psychology*, 87, 631-648.
- Forster, L. E., & Stoller, E. P. (1992). The impact of social support on mortality: A seven-year follow-up of older men and women. *Journal of Applied Gerontology*, 11, 173-186.
- Fredrickson, B. L. (2001). The role of positive emotion in psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56, 218-226.
- Gilliom, M., Shaw, D. S., Beck, J. E., Schonberg, M. A., & Lukon, J. L. (2002). Anger regulation in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. *Developmental Psychology*, 38, 222.
- Gottman, J. M. (1994). *What Predicts Divorce? The Relationship Between Marital Processes and Marital Outcomes*. Hillsdale, NJ: Lawrence Erlbaum.

- Gottman, J. M., Coan, J., Carrere, S., & Swanson, C. (1998). Predicting marital happiness and stability from newlywed interactions. *Journal of Marriage and the Family*, 60, 5-22.
- Gottman, J. M., Katz, L. F., & Hooven, C. (1996). Parental meta-emotion philosophy and the emotional life of families: Theoretical models and preliminary data. *Journal of Family Psychology*, 10, 243-268.
- Gross, J. J. (1998). Antecedent-and response-focused emotion regulation: divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, 74, 224.
- Gross, J. J. (2001). Emotion regulation in adulthood: Timing is everything. *Current Directions in Psychological Science*, 10, 214-219.
- Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, 52, 511.
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspectives on Psychological Science*, 10, 227-237.
- Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, 7, e1000316.
doi:doi:10.1371/journal.pmed.1000316
- Holt-Lunstad, J., & Uchino, B. N. (2015). Definition and Conceptualizations of Social Support. *Health behavior: Theory, Research, and Practice*, 183.
- Holt-Lunstad, J., Uchino, B. N., Smith, T. W., & Hicks, A. (2007). On the importance of relationship quality: The impact of ambivalence in friendships on cardiovascular functioning. *Annals of Behavioral Medicine*, 33, 278-290. doi:10.1007/bf02879910

- Hostinar, C. E., Sullivan, R. M., & Gunnar, M. R. (2014). Psychobiological mechanisms underlying the social buffering of the hypothalamic–pituitary–adrenocortical axis: A review of animal models and human studies across development. *Psychological Bulletin*, 140, 256.
- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, 241, 540-545.
- Keltner, D., & Haidt, J. (2001). Social functions of emotions.
- Kemeny, M. E. (2003). An interdisciplinary research model to investigate psychosocial cofactors in disease: Application to HIV-1 pathogenesis. *Brain, Behavior, and Immunity*, 17, 62-72.
- Kiecolt-Glaser, J. K., Gouin, J.-P., & Hantsoo, L. (2009). Close relationships, inflammation, and health. *Neuroscience and Biobehavioral Reviews*, 35, 33-38.
doi:10.1016/j.neubiorev.2009.09.003
- Kiecolt-Glaser, J. K., & Wilson, S. J. (2017). Lovesick: how couples' relationships influence health. *Annual Review of Clinical Psychology*, 13, 421-443.
- Kitayama, S., Park, J., Boylan, J. M., Miyamoto, Y., Levine, C. S., Markus, H. R., Karasawa, M., Coe, C. L., Kawakami, N., & Love, G. D. (2015). Expression of anger and ill health in two cultures: An examination of inflammation and cardiovascular risk. *Psychological Science*, 26, 211-220.
- Kobak, R. R., & Sceery, A. (1988). Attachment in late adolescence: Working models, affect regulation, and representations of self and others. *Child Development*, 135-146.
- Mauss, I. B., Cook, C. L., Cheng, J. Y., & Gross, J. J. (2007). Individual differences in cognitive reappraisal: Experiential and physiological responses to an anger provocation. *International Journal of Psychophysiology*, 66, 116-124.

- Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change*. New York: Guilford Press.
- Morris, A. S., Criss, M. M., Silk, J. S., & Houlberg, B. J. (2017). The Impact of Parenting on Emotion Regulation During Childhood and Adolescence. *Child Development Perspectives*.
- Morris, A. S., Silk, J. S., Steinberg, L., Myers, S. S., & Robinson, L. R. (2007). The role of the family context in the development of emotion regulation. *Social development, 16*, 361-388.
- Mund, M., & Mitte, K. (2012). The costs of repression: a meta-analysis on the relation between repressive coping and somatic diseases. *Health Psychology, 31*, 640-649.
- Reis, H. T., & Shaver, P. (1988). Intimacy as an interpersonal process. In S. Duck (Ed.), *Handbook of personal relationships* (pp. 367-389). Chichester, England: Wiley.
- Robles, T. F., Slatcher, R. B., Trombello, J. M., & McGinn, M. M. (2014). Marital quality and health: A meta-analytic review. *Psychological Bulletin, 140*, 140-187.
- Roisman, G. I., Madsen, S. D., Hennighausen, K. H., Sroufe, L. A., & Andrew Collins, W. (2001). The coherence of dyadic behavior across parent–child and romantic relationships as mediated by the internalized representation of experience. *Attachment & human development, 3*, 156-172.
- Rose, A. J., Carlson, W., & Waller, E. M. (2007). Prospective associations of co-rumination with friendship and emotional adjustment: considering the socioemotional trade-offs of co-rumination. *Developmental Psychology, 43*, 1019.
- Ruiz, J. M., Hamann, H. A., Mehl, M. R., & O'Connor, M.-F. (2016). The Hispanic health paradox: From epidemiological phenomenon to contribution opportunities for psychological science. *Group Processes & Intergroup Relations, 19*, 462-476.

- Seeman, T. E. (2000). Health promoting effects of friends and family on health outcomes in older adults. *American Journal of Health Promotion, 14*, 362-370.
- Selcuk, E., & Ong, A. D. (2013). Perceived partner responsiveness moderates the association between received emotional support and all-cause mortality. *Health Psychology, 32*, 231-235.
- Shaver, P. R., & Mikulincer, M. (2007). Adult attachment strategies and the regulation of emotion. *Handbook of emotion regulation, 44*.
- Slatcher, R. B., & Schoebi, D. (2017). Protective processes underlying the links between marital quality and physical health. *Current Opinion in Psychology, 13*, 148-152.
- Slatcher, R. B., & Selcuk, E. (2017). A social psychological perspective on the links between close relationships and health. *Current Directions in Psychological Science, 26*, 16-21.
- Soto, J. A., Perez, C. R., Kim, Y.-H., Lee, E. A., & Minnick, M. R. (2011). Is expressive suppression always associated with poorer psychological functioning? A cross-cultural comparison between European Americans and Hong Kong Chinese. *Emotion, 11*, 1450.
- Swanson, J., Valiente, C., Lemery-Chalfant, K., & Caitlin O'Brien, T. (2011). Predicting early adolescents' academic achievement, social competence, and physical health from parenting, ego resilience, and engagement coping. *The Journal of Early Adolescence, 31*, 548-576.
- von Salisch, M. (2001). Children's emotional development: Challenges in their relationships to parents, peers, and friends. *International Journal of Behavioral Development, 25*, 310-319.